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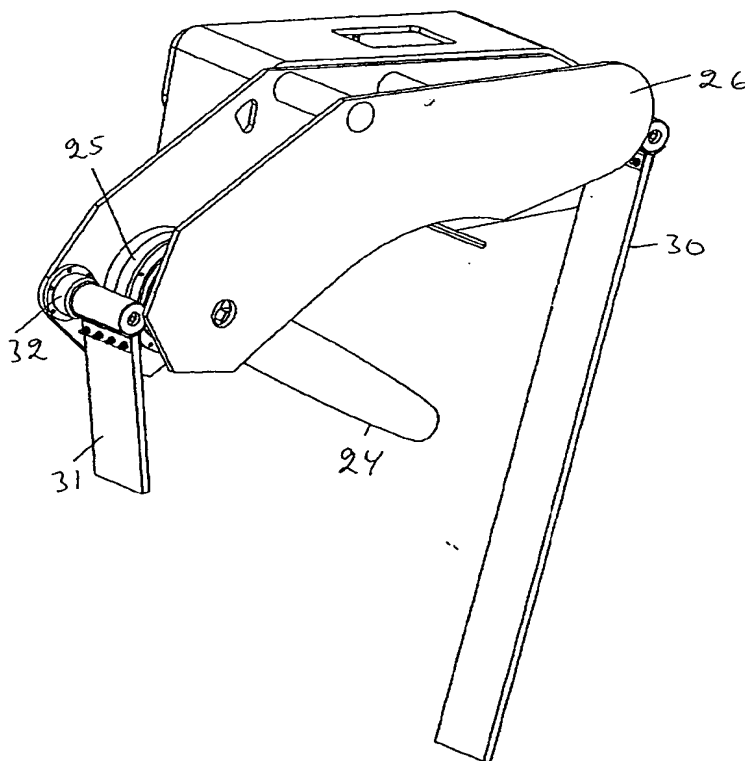
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[Continued on next page]

(54) Title: AN APPARATUS FOR CUTTING A TREE TRUNK



(57) Abstract: A single grip harvester head (14) has a chain saw (23) that is mounted to be swingable by a motor (25) into an inoperative position in a shield (26) and swingable out of the inoperative position for cutting a gripped and lifted tree trunk. A guard (30) is mounted to be swingable such that its mounting is adjacent the free end of the saw bar (24) when the saw (23) is in its inoperative position. The axes of swinging of the saw and the guard are parallel and the guard is swingable between an operative position in which it is transverse to the saw bar and a retracted inoperative position. The guard is used during a cutting operation with the tree trunk suspended but it is retracted during felling.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

An apparatus for cutting a tree trunk

Technical field of the invention

This invention relates to a unit arranged to be carried by an arm on a forestry vehicle, comprising gripping means for gripping and lifting tree trunks and a chain saw that is suspended to be swingable by a motor into an inoperative swung-back position in a shield and swingable from its inoperative position to a position for cutting a gripped and lifted tree trunk.

Background of the invention

Single-grip harvesters are used to grip a tree trunk close to the ground and cut it off, lift it to horizontal position without changing grip and then strip the trunk of branches and cut the trunk into logs.

In such a cutting with the tree trunk in a suspended position, one wants a higher cutting power than used for felling only. Since the tree trunk has a free-hanging end during the cutting, the cutting must be fast in order to avoid cracks at the end of the cutting. The high cutting power is reached by a higher speed of the chain, which increases the stress on the chain and results in increased risk of chain breakage. The high velocity throws away the chain at a high velocity if the chain breaks and is a risk to the driver also when the driver is in a cabin, and it is of course also a risk to a third person.

There is the same risk when felling heads are used that fell and cut into logs but do not strip off the branches and at grapple saw heads that lifts a bundle of thin trunks and cuts the entire bundle.

Object of invention

It is an object of the invention to reduce the risk of injuring people when forestry units of the kind described above are used. Principally, this is achieved with a guard suspended swingably such that its mounting end is adjacent the free end of the saw bar when the saw is in its inoperative position, wherein the swing axes of the of the saw and the guard are parallel and the guard is swingable between an operative position in which it is directed transverse to the chain bar and a swung-back inoperative position.

The invention is defined by the claims

Brief description of the drawings

The drawings show two units as examples of the invention.

- Figure 1 is a side view of a wheeled forestry machine, a harvester, with a single grip harvester head in accordance with the invention.
- Figure 2 is a side view on a larger scale of the single grip harvester head shown in figure 1.
- Figure 3 is a front end view of a the single grip harvester head shown in figures 1 and 2.
- Figure 4 is a top view of the single grip harvester head shown in figures 1-3.
- Figure 5 is a perspective view of a cutting unit that is part of the single grip harvester head.
- Figure 6 is a perspective view corresponding to figure 4 but showing some elements in other positions.
- Figure 7 is a perspective view of a grapple saw in accordance with the invention.

Description in more detail of the illustrated examples of the invention

Figure 1 shows schematically a harvester with a wheeled vehicle 11 that carries a crane 12,13 with a boom 12 that is swingable about a vertical axis. The boom carries an axially displaceable stick 13 which in its turn carries a single grip harvester head 14 that is rotatable in a rotator 15 and also tiltable. The rotator is freely suspended in the stick 13 but it is not turnable. The operator in the cabin 16 can move the head into all positions within the reach of the crane and control all the functions of the head, but the means for this is not illustrated in detail since they are conventional. Figure 2 shows the head 14 on a larger scale and in more detail. It is suspended in a tilt link 20 which is suspended in the rotator 15 and the head can be tilted about a shaft 21. In the figures, the head is shown in its position for felling.

At the lower end of the head 14, there is a cutting unit 22 that is shown in the perspective views, figures 4 and 5. A chain saw 23 with a saw bar 24 is mounted in the cutting unit and it is swingable out of the cutting unit by being swung about an axis I by means of a turning motor 25 coaxial with the axis. In figure 4, the saw bar 24 is shown in its position in which it is swung into the cutting unit where it is protected by a protecting plate 26, and

in figure 5, the saw bar is shown in its position in which it is swung out of the cutting unit as during a cutting operation.

An elongated guard 30 of an elastically yieldable material, for example thick reinforced rubber, is suspended to be swingable about an axis II that is parallel with the swing axis of the saw. Its mounting is just in front of the tip of the saw bar when the saw is in its inoperative position. A similar but shorter guard 31 is mounted in the same way behind the saw to be swingable about an axis III that is also parallel with the swing axis of the saw. The guards are swingable by concentric turning motors and the motor 32 for swinging the short guard 31 can be seen in figures 4 and 5. The two guards 30 and 31 are not shown in figures 2 and 3.

In figure 5, the two guards 30 and 31 are shown swung back into their inoperative positions and in figure 6 they are shown in their operative positions. The guard 30 is swung out when in its operative position so that it is directed transverse to the saw bar, and the saw bar will then be directed towards the guard during its entire swinging out movement in a cutting operation so that the guard will catch the saw chain should the chain break and be thrown away from the saw bar. The guard is long enough to cover the saw bar also when the saw bar is fully swung out.

In the conventional way, the head has two feeding wheels 35,36 that are mounted to be swingable. In figures 2 and 3, they are shown in their positions moved apart, but in their operative positions, they are loaded towards each other in order to clamp a tree trunk between them. The head has an upper two-part branching knife 37a and 37b, a lower two-part branching knife 38a and 38b, and a counting wheel 39. The branching knives are shown in their open positions. In their closed positions, they guide the trunk without preventing it from being forwarded by the feeding wheels 35,36.

A working operation will now be described

The head is moved towards the bottom part of the tree that is to be felled. The feeding wheels 35,36 and the branch knives 37,38 are open and swung inwards when the head embraces the tree. With its guards 30,31 in their inoperative positions, the chain saw 23 is swung out and cuts the trunk while the trunk is firmly held by the feeding wheels and the branch knives. After the cutting, the head is lifted by the crane 12,13 and swung in

the tilt link 20 so that the tree trunk will be substantially horizontal with its top dragging along the ground. In this suspended position, the tree trunk is moved forwards by the feeding wheels and the branch knives prevent the trunk from falling out of the head. The counting wheel 39 is coupled to stop the feeding motion when a predefined length of the tree trunk has been moved forwards. The branch knives 37,38 strips off the branches during this movement. The guards 31,32 are swung out into their operative positions as shown in figure 5, and the chain saw 23 is swung out cutting off the trunk. The guards are then swung back into their inoperative positions shown in figure 4. After another feeding movement, the trunk is again cut off in the same way with the guards in their swung-out positions and this operation is continued until the trunk is cut into logs of predefined length.

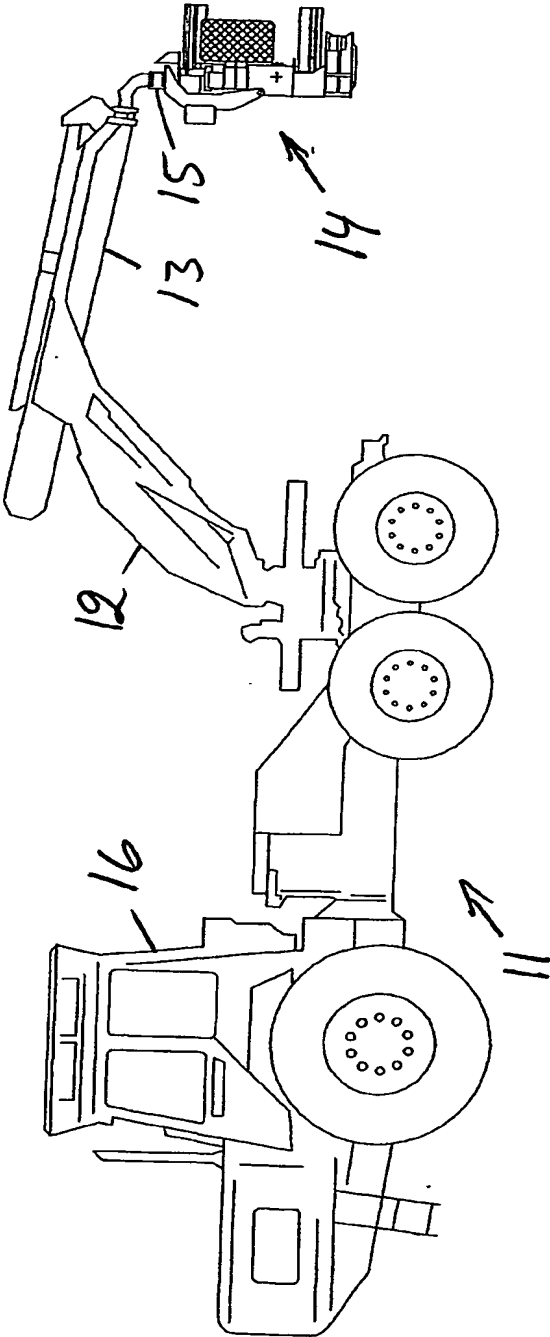
Since the guards 30,31 are swung into their protected inoperative positions after every so called free-hanging cutting, there is no risk that they will be destroyed by branches during the branch-stripping operation. The fact that the guards are not rigid but are yieldable reduces the risk of damage further. Neither are the guards in the way nor can they be damaged during the felling since they are then in their protected positions. The saw is close to the ground during the felling and a guard is not necessary then since the chain will soon be stopped by the ground if it should break. Since the guards are long and elastically yieldable, they will dampen a thrown-out chain better than a stiff guard. The guards can suitably be made of reinforced rubber and be more than 3 cm thick.

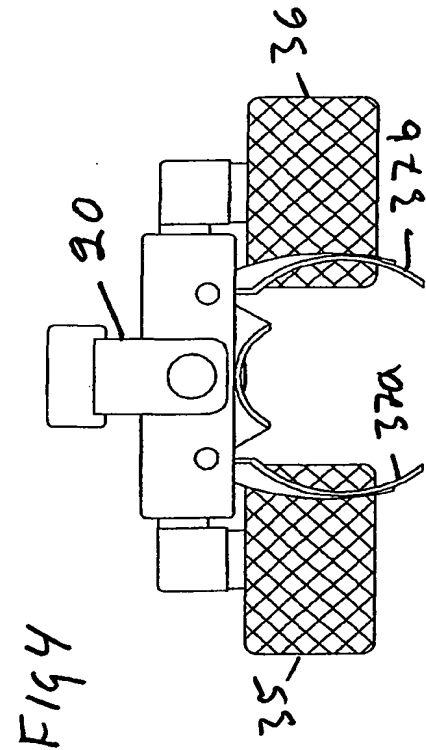
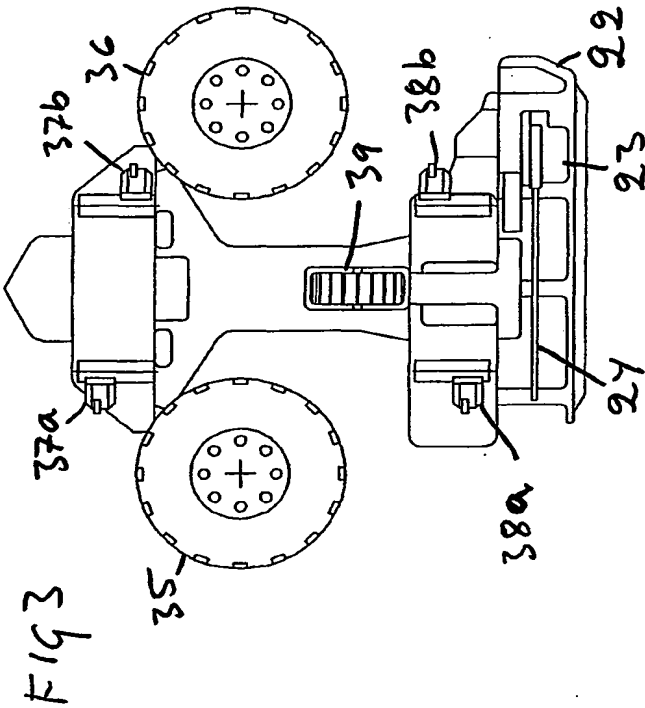
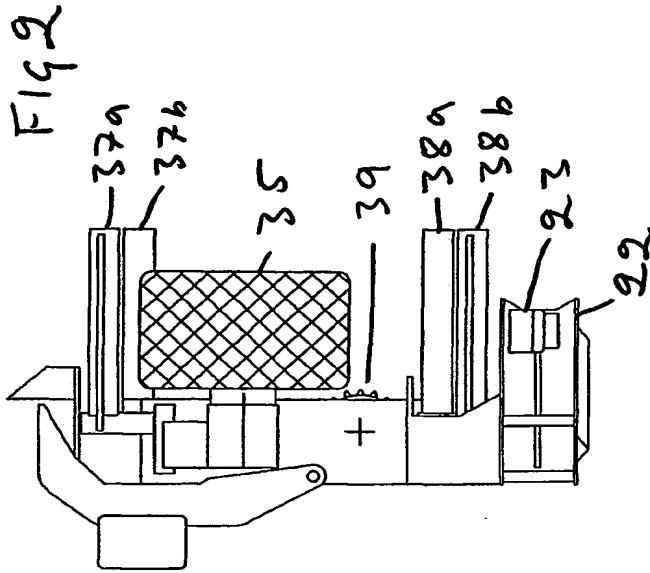
Figure 6 shows a conventional grapple saw head by which a bundle of thin trunks can be gripped and in such a free-hanging position cut in a single cutting operation. The grapple saw head has a rotator 15 by which it can be suspended in a crane in the same way as the harvester head shown suspended in figure 1. The grapple saw head has two gripper claws 42 and a gripper claw 41 opposite the claws 42. It has also a cutting unit 43 with a guard 30, arranged in the same way as in the figures 4 and 5, and a saw bar as in the previous figures. The saw bar denoted by 24. Since the guard can be swung in as described, it will not be in the way neither during the gripping nor when the grapple saw is used for loading instead of for cutting.

Claims

1. A unit arranged to be carried by an arm (12,13) on a forestry vehicle (11), comprising gripping means (35,36; 41,42) for gripping and lifting tree trunks and a chain saw (23) that is suspended to be swingable by a motor (25) into an inoperative swung-back position in a shield (26) and swingable from its inoperative position to a position for cutting a gripped and lifted tree trunk, characterised by
a guard (30) suspended swingably such that its mounting end is adjacent the free end of the chain bar (24) when the saw (23) is in its inoperative position, wherein the swing axes of the of the saw and the guard are parallel and the guard is swingable between an operative position in which it is directed transverse to the chain bar and a swung-back inoperative position.
2. A unit according to claim 1, **characterised in** that it is a single-grip harvester head with two feeding wheels (35,36), which are biased against each other but can be moved away from each other, and two branch cutters (37,38), which can be opened.
3. A unit according to claim 2, **characterised in** that the guard (30) consists of an elastically yieldable material.
4. A unit according to claim 3, **characterised in** that the guard (30) consists of reinforced rubber.

Fig 1





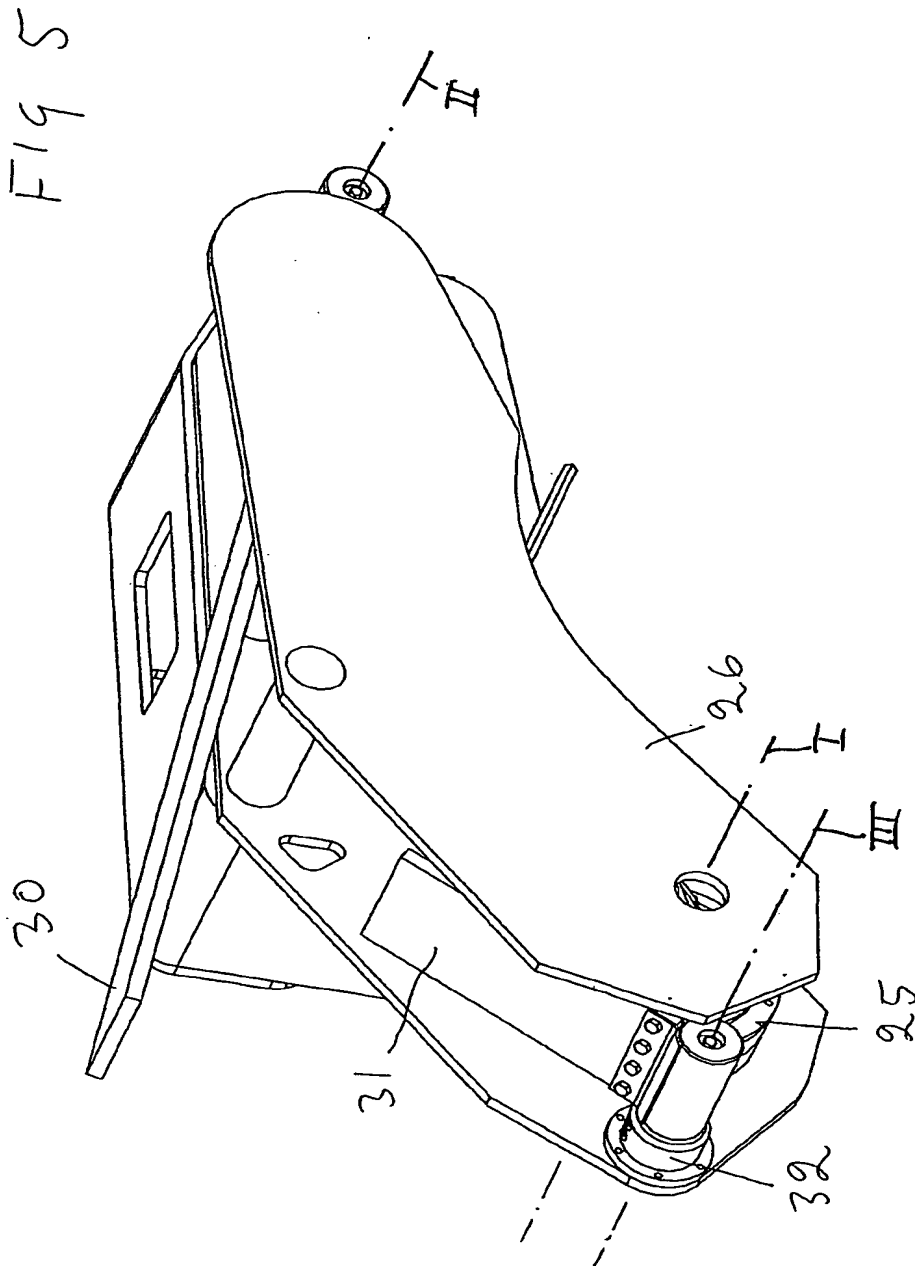


Fig 6

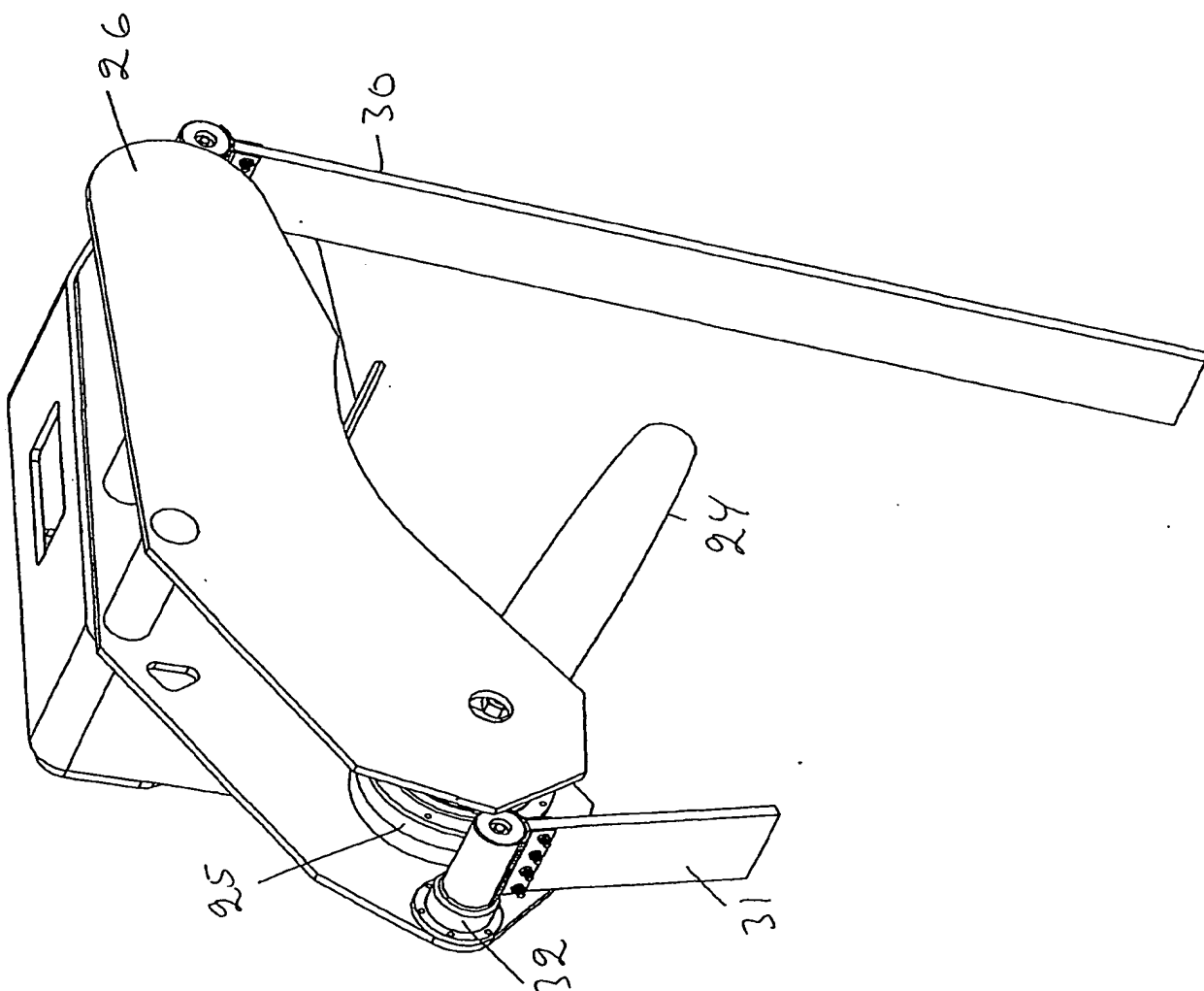
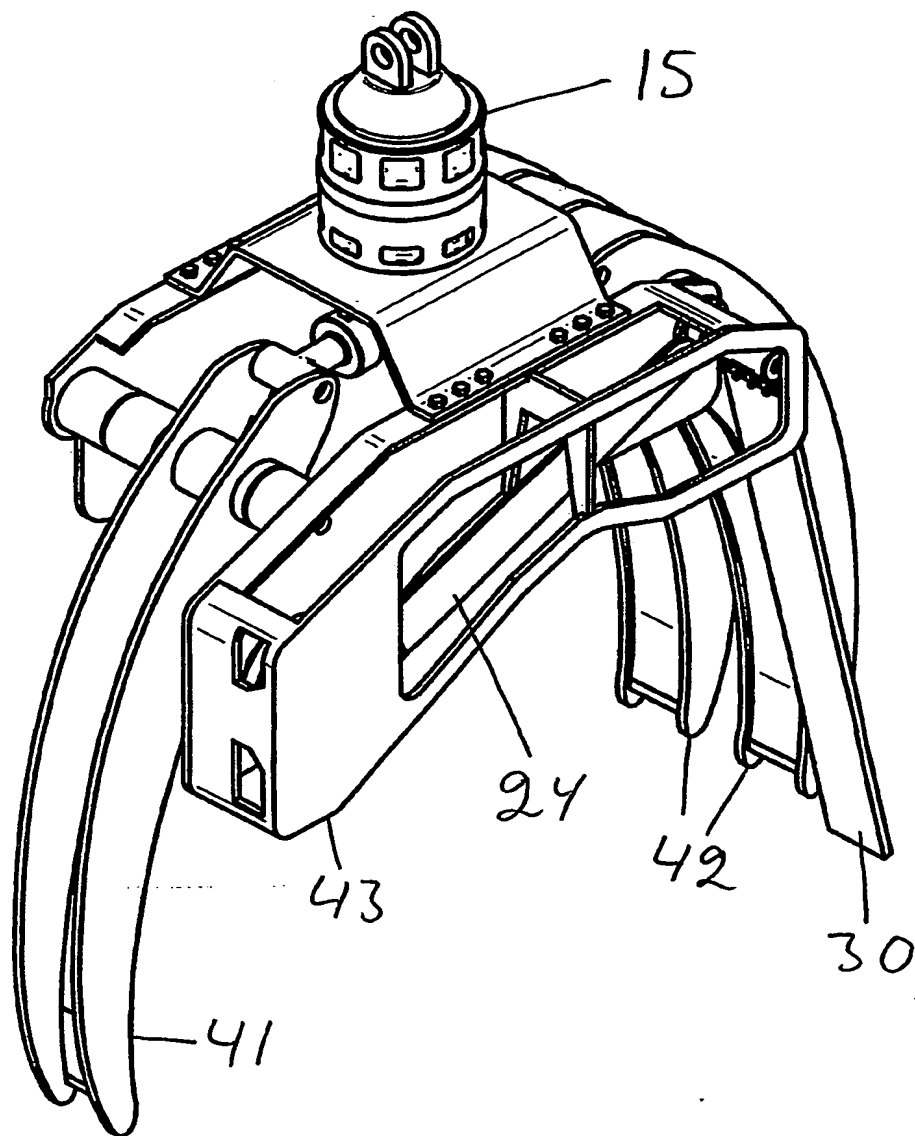


FIG 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/00424

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A01G 23/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A01G, B27G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5850696 A (ANGELO SCIARRONE), 22 December 1998 (22.12.98), figure 3, claim 1 --	
A	US 4991297 A (MYRON C. CAIN), 12 February 1991 (12.02.91), figure 1, abstract -- -----	

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/SE 02/00424

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	5850696	A	22/12/98	NONE	
US	4991297	A	12/02/91	NONE	